Campus Cyberinfrastructure - Network Infrastructure and Engineering Program (CC-NIE)

PROGRAM SOLICITATION
NSF 13-530

REPLACES DOCUMENT(S):
NSF 12-541

National Science Foundation

Office of Cyberinfrastructure

Directorate for Computer & Information Science & Engineering
Division of Computer and Network Systems

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

April 03, 2013

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 13-1, was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in NSF 13-1 apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 14, 2013, must also follow the guidelines contained in NSF 13-1.

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, National Science Foundation's Merit Review Criteria: Review and Revisions. While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the *Grant Proposal Guide* and the *Award & Administration Guide*.

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the Grant Proposal Guide.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Campus Cyberinfrastructure - Network Infrastructure and Engineering Program (CC-NIE)

Synopsis of Program:

The "Campus Cyberinfrastructure - Network Infrastructure and Engineering (CC-NIE)" program invests in improvements and re-engineering at the campus level to support a range of data transfers supporting computational science and computer networks and systems research. The program also supports Network Integration activities tied to achieving higher levels of performance, reliability and predictability for science applications and distributed research projects. Two types of CC-NIE awards will be made. Data Driven Networking and Infrastructure for the Campus and Researcher awards will be supported at up to $500,000 total for up to 2 years. Network Integration and Applied Innovation awards will be supported at up to $1,000,000 total for up to 2 years.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Kevin Thompson, OCI Program Director, telephone: (703) 292-4220, email: kthompso@nsf.gov
- Joseph B. Lyles, CNS Program Director, telephone: (703) 292-7152, email: jlyles@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.070 --- Computer and Information Science and Engineering
- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 15 to 30

Anticipated Funding Amount: $15,000,000 to $18,000,000 dependent upon the availability of funds for FY 2013. Data Driven Networking Infrastructure for the Campus and Researcher awards will be supported up to $500,000 total for up to 2 years. Network Integration and Applied Innovation awards will be supported up to $1,000,000 total for up to 2 years.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  April 03, 2013

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

NSF has a rich history of investment in domestic and international networking support for research and education. These investments extend to supporting innovation in networking technology. NSF investment in networking cyberinfrastructure and innovation dates back 25 years to NSFNET, followed in the mid-1990's with vBNS and continuing through 2003 with the High Performance Network Connections (HPNC) program. Over 200 universities and research facilities received NSF awards through those programs. More recently, the Office of Experimental Program to Stimulate Competitive Research (EPSCoR) has supported intra-campus and inter-campus network connections through its Research Infrastructure Improvement Program: Inter-Campus and Intra-Campus Cyber Connectivity (RII C2), and almost 20% of the proposals submitted to the Academic Research Infrastructure (ARI) program were in the area of campus and regional networking.

In 2010, the Department of Commence awarded $62.5M in federal stimulus funding through its Broadband Technology Opportunities Program to establish a 100Gbps national backbone, the Unified Community Anchor Network (UCAN), to link regional networks with thousands of schools and libraries. As a result, Internet2 is completing an 8+ Terabit-per-second capacity national backbone upgrade with 100 Gbps wide area network links. The NSF community, in order to most effectively leverage emerging network backbone capacities and capabilities, must be supported end-to-end. This means removing barriers, re-engineering with an end-to-end perspective, upgrading facilities and connections, and introducing new services that extend through regional and state optical networks to the location of the NSF researchers and students - individual campuses. Also in recent years, the network research community has, through NSF Computer & Information Science & Engineering (CISE) initiatives such as the Global Environment for Network Innovation (GENI) and Future Internet Architectures (FIA), generated new ideas and approaches in next-generation networking. The potential and opportunity to move these discoveries onto campus environments requires in many cases new development and integration, and many of the principles described above for driving network infrastructure improvements.

The Campus Cyberinfrastructure - Network Infrastructure and Engineering (CC-NIE) program invests in improvements and re-engineering at the campus level to support a range of scientific data transfers and movement. The program also supports Network Integration activities tied to achieving higher levels of performance, reliability and predictability for science applications and distributed research projects. Two types of CC-NIE awards will be made. Data Driven Networking and Infrastructure for the Campus and Researcher awards will be supported at up to $500,000 total for up to 2 years. Network Integration and Applied Innovation awards will be supported at up to $1,000,000 total for up to 2 years.

II. PROGRAM DESCRIPTION

The Campus Cyberinfrastructure - Network Infrastructure and Engineering (NIE) program welcomes proposals in two categories: Data Driven Networking Infrastructure for the Campus and Researcher and Network Integration and Applied Innovation.

Data Driven Networking Infrastructure for the Campus and Researcher

Proposals submitted to this area should address network infrastructure improvements at the campus level to enable national and global high-performance end-to-end access to dynamic network services that in turn enable rapid, unimpeded movement of diverse and distributed scientific data sets and advanced distributed computing. These networking improvements include, but are not limited to, the following types of activities:

- network upgrades within a campus network to support a wide range of science data flows (including large files, distributed data, sensor networks, real-time data sources, and virtualized instruments for computer systems research)
- re-architecting a campus network to support large science data flows, for example by designing and building a "science DMZ" (see http://fasterdata.es.net/fasterdata/science-dmz/ for more information on the "science DMZ" approach)
- network connection upgrade for the campus connection to a regional optical exchange or point-of-presence that connects to Internet2 or National Lambda Rail.

Proposals must address scientific and engineering project and application drivers that require network engineering or upgrades of their existing infrastructure. Proposals must also present project-specific end-to-end scenarios for data movement, distributed computing, and other end-to-end services driving the networking upgrade. Proposals are strongly encouraged to include in their description of data movement scenarios and use-cases a quantitative element, for example providing current or historical data flow rates. Proposals should consider expected outcomes; they should explain the compelling need for proposed network improvements in light of current conditions and expected enabling benefits to identified science drivers and applications. Proposals are encouraged to describe end-to-end data transfers that include access to and use of wide area dynamic circuit networking services if available

and where applicable. Institutions who are recipients of data network related instruments, such as the Major Research Infrastructure (MRI) program supported Dynamic Network System (DYNES), or other NSF-supported networking or data movement instrumentation are expected to leverage such resources in their approach. Inclusion of itemized vendor quotes is strongly advised for all proposals.

Proposals must include a Campus Cyberinfrastructure plan within which the proposed network infrastructure improvements are conceived, designed, and implemented in the context of a coherent campus-wide strategy and approach to Cyberinfrastructure (CI) that is integrated horizontally intra-campus and vertically with regional and national CI investments and best practices. Further, proposals are expected to address within the Campus CI plan the sustainability of the proposed work in terms of ongoing operational and engineering costs. The plan should also describe campus IPv6 deployment and use of the InCommon Federation global federated system. This Campus CI plan must be included as a supplementary document and is limited to no more than 5 pages.

All proposals in this area must document explicit partnerships or collaborations with the campus Information Technology (IT)/networking organization, as well as one or more domain scientists, research groups, and educators in need of the new network capabilities. Partnership documentation from personnel not included in the proposal as PI, Co-PI, or Senior Personnel should be in the form of a letter of commitment located in the supplementary documents section of the proposal. Proposals are expected to describe an approach to end-to-end network performance measurement based on the perfSonar framework with associated tool installation and use; proposals may describe an alternative approach to perfSonar with sufficient justification.

Equipment requests for storage or computing resources are expressly disallowed in this networking solicitation.

Any budget request for professional services, such as IT staff support, must be documented in coordination with the institution's campus IT or CIO organization. Proposals may ask for up to one full time equivalent (FTE) of professional staff support, but such requests should address the role of a network performance engineer and the campus IT's sustainability plan for such resources.

Proposals asking for funds supporting new fiber builds must describe fiber use plans that include long term planning for supporting innovation through reserved capacity.

An award in this program area is not the appropriate mechanism to provide support for individual faculty research projects. Requests for support of such projects should be directed to NSF's research grant programs.

Smaller institutions with fundamental challenges to address in networking infrastructure and resources may also choose to apply for planning grants, professional staff support for networking expertise in their Campus IT organization, or other professional network infrastructure help for education driven networking improvements. Smaller institutions are encouraged to partner with institutions to share expertise and share resources to support these activities. As with all proposals, requested funding amounts should be commensurate with activities described in the project description.

Proposals in this area are required to have titles that begin with "CC-NIE Networking Infrastructure:" then the title of your project.

Network Integration and Applied Innovation

This program area supports end-to-end network CI through integration of existing and new technologies and applied innovation. The goal is to take advantage of research results, prototypes, and emerging innovations to use them to enable specified researchers in a networking context. Proposals in this area may leverage new and existing investments in network infrastructure, services, and tools by combining or extending capabilities to work as part of the CI environment used by scientific applications and users.

Unlike proposals directed to the "Data Driven Networking Infrastructure for the Campus and Researcher" program area that focus primarily on equipment-based data networking improvements, proposals in this area support the development and integration of innovative networking capabilities; network-related software development and deployment activities resulting in an operational environment prototype are expected to be part of the proposed activities.

A broad range of activities is covered by this area, including but not limited to:

- Integration of networking protocols and technologies with application layer code and processes;
- Transitioning successful research prototypes in Software Defined Networking (SDN), activities supported by NSF's Global Environment for Network Innovations (GENI) and Future Internet Architectures (FIA) programs, and others, to distributed scientific environments and campus infrastructure;
- Innovative network solutions to problems driven by distributed computing and storage systems including cloud services;
- Federation-based security solutions for dynamic network services extending end-to-end;
- Network engineering support through the creation and application of new and novel procedures and tools for solving end-to-end network performance issues, especially for dynamically constructed network services;
- International - experimental deployment of new networking protocols and technologies between end points using an international path. Proposals in this category are encouraged to leverage international partnerships and existing network services to trial and prototype new dynamic networking services. NSF's International Research Network Connections (IRNC) program funds a set of multi-gigabit per second links between the U.S. and other regions of the world. These projects also support to varying degrees experimental networking activities through, for example, OpenFlow-capable switches. A description of IRNC project network services and contacts available is shown at www.irnclinks.net. Note that international partners cannot be supported under this solicitation.

Proposals in this area must identify one or more supported science or engineering research projects or applications and describe how the proposed network integration activities will support those projects, particularly in the context of addressing data movement, throughput, and predictable performance end-to-end. Proposals in this area must include clear project goals and milestones. Proposals must define base metrics relevant to the proposal goals and address measurement and evaluation of the resulting system. Any software development under proposed activities must be made available under an open source license. Proposals in this area are encouraged to request some travel support, up to $5000 total for the entire project, to fund community dissemination activities.

As with Data Driven proposals, submissions under Network Integration must also include a Campus Cyberinfrastructure plan within which the proposed network integration and innovation activities are conceived, designed, and implemented in the context of a coherent campus-wide strategy and approach to Cyberinfrastructure (CI) that is integrated horizontally intra-campus and vertically with regional and national CI investments and best practices. Further, proposals are expected to address within the Campus CI plan the sustainability of the proposed work in terms of ongoing operational and engineering costs. The plan should also address campus IPv6 deployment and use of the InCommon Federation global federated system. This Campus CI plan must be included as a supplementary document and is limited to no more than 5 pages.

Proposals in this area require titles that begin with "CC-NIE Integration:" then the title of your project.

III. AWARD INFORMATION

$15,000,000 - $18,000,000 dependent upon the availability of funds for FY 2013. Data Driven Networking Infrastructure for the

Campus and Researcher awards will be supported at up to $500,000 total for up to 2 years. Network Integration and Applied Innovation awards will be supported at up to $1,000,000 total for up to 2 years.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

For Data Driven Networking Infrastructure for the Campus and Researcher Proposals:

Proposals in this area require titles that begin with "CC-NIE Networking Infrastructure:" followed by project-specific text.

All proposals in this area must document explicit partnerships or collaborations with the campus IT/networking organization, as well as one or more domain scientists, research groups, and educators in need of the new network capabilities. Partnership documentation from personnel not included in the proposal as PI, Co-PI, or Senior Personnel should be in the form of a letter of commitment located in the supplementary documents section of the proposal

Refer to Section II, Program Description, for additional information about requirements for CC-NIE proposals. In particular, a Campus CI Plan must be included, with a limit of up to 5 pages, as a supplemental document.

For Network Integration and Applied Innovation Proposals:

Proposals in this area require titles that begin with "CC-NIE Integration:" followed by project-specific text.

Proposals in this area must identify one or more supported science or engineering research projects or applications and describe how the proposed network integration activities will support those projects, particularly in the context of addressing data movement, throughput, and predictable performance end-to-end. Where appropriate, proposals are encouraged to document explicit partnerships or collaborations with the campus IT/networking organization. Proposals in this area must include clear project goals and milestones. Any software development under proposed activities should identify the open source license used.

Refer to Section II, Program Description, for additional information about requirements for CC-NIE proposals. In particular, a Campus CI Plan must be included, with a limit of up to 5 pages, as a supplemental document.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

Budget Preparation Instructions: Budgets should include travel funds for the project principal investigators and other team members as appropriate from all collaborating institutions to attend one annual Principal Investigators' meeting.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  April 03, 2013

D. FastLane / Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

  Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

  Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: https://www.fastlane.nsf.gov/fastlane.jsp.

- **For Proposals Submitted Via Grants.gov:**

  Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

  Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/meritreview/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years (FY) 2011-2016*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the core strategies in support of NSF's mission is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students, and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the variety of learning perspectives.

Another core strategy in support of NSF's mission is broadening opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (GPG Chapter II.C.2.d.i. contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including GPG Chapter II.C.2.d.i. , prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

All CC-NIE projects will be reviewed with careful attention to the following:

- The expected impact on the deployed environment described in the proposal.
- The extent to which the value of the work is described in the context of a needed capability required by science and engineering, and potential impact across a broader segment of the NSF community.
- A project plan that addresses in its goals and milestones the end result of a working system in the target environment.
- Where applicable, how resource access control, federated identity management, and other cybersecurity related issues and community best practices are addressed.
- **A Campus Cyberinfrastructure Plan** - How well does the cyberinfrastructure plan support and integrate with the institutions' science and technology plan? To what extent is the cyberinfrastructure plan likely to enhance capacity for discovery, innovation, and education in science and engineering? How well does the plan as presented position the proposing institution(s) for future cyberinfrastructure development? Are IPv6 deployment and InCommon federation addressed? Are the activities described in the proposal consistent with the institution's cyberinfrastructure plan?
- **Additionally for CC-NIE Integration projects: Tangible metrics** described to measure the success of the integrated

systems and any associated software developed, and the steps necessary to take the systems from prototype status to production use.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational), publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at

http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Kevin Thompson, OCI Program Director, telephone: (703) 292-4220, email: kthompso@nsf.gov
- Joseph B. Lyles, CNS Program Director, telephone: (703) 292-7152, email: jlyles@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at http://www.grants.gov.

Related Programs:

NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging, *Final Report,* March 2011.
Available from: http://www.nsf.gov/od/oci/taskforces/TaskForceReport_CampusBridging.pdf

Reference material on the "Science DMZ" concept is available at: http://fasterdata.es.net/fasterdata/science-dmz/

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The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at http://www.nsf.gov

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230

- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50 , "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51 , " Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

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